# A Cross-level Examination of the Process Linking Transformational Leadership and Creativity: the Role of Psychological Safety Climate

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## Abstract

Drawing on the social information process perspective, we hypothesized that transformational leadership fosters psychological safety climate leading to enhanced individual-level creative process engagement. Furthermore, psychological safety climate was hypothesized to strengthen the relationship between creative process engagement and employee creativity. The hypothesized model was tested with data obtained from a sample of 358 employees and their supervisors from two organizations in the People's Republic of China. Results of hierarchical linear modeling (HLM) analysis revealed that transformational leadership influenced creative process engagement via psychological safety climate. Furthermore, psychological safety climate moderated the creative process engagement-creativity relationship such that the relationship was stronger in groups with high rather than low psychological safety climate.

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## Introduction

Given the important role that creative performance plays in organizational adaptation to an increasingly turbulent marketplace, it is not surprising that researchers as well as managers are keen to understand how to facilitate creativity in the workplace (Shalley, Zhou, & Oldham, 2004). Perhaps because of the centrality of leaders in eliciting desirable employee behaviors, much research has examined the role of leadership in fostering employee creativity (Mumford, Scott, Gaddis, & Strange, 2002; Shalley & Gilson, 2004). As one of dominant leadership models in enhancing positive employee behaviors, transformational leadership has received particular attention (e.g. Gong, Huang, & Farh, 2009; Shin & Zhou, 2003). Scholars have suggested that transformational leaders can influence employee creativity through two different ways. On one hand, transformational leadership promotes employee's motivation, attitudes, capabilities and interest in creative problem-solving (individual-level factors), leading to employee creativity (e.g. Mumford et al., 2002). On the other hand, transformational leadership can influence employee creativity by fostering a social environment (group-level factors) that is conducive to employee creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Jung, Chow, & Wu, 2003).

Much research has contributed useful insights to the former, the impact of transformational leadership on employee creativity by demonstrating the mediating influences of intrinsic motivation (Shin & Zhou, 2003), confidence in creative performance (Gong et al., 2009), needs satisfaction (Kovjanic, Schuh, Jonas, Quaquebeke, & Dick, 2012), and work engagement (Aryee, Walumbwa, Zhou, & Hartnell, 2012). However, less is known about the

latter, how transformational leadership may have an impact on employee creativity via its influence on employee's social environment such as group climate. This is surprising given the nested nature of organizational life and the growing recognition of multi-level influences on the experience of work and employee outcomes (Bliese, 2000; Kozlowski & Klein, 2000) as well as the demonstrated influence of leaders on group climate (e.g. Chen, Kirkman, Kanfer, Allen, & Rosen, 2007; Liao & Chuang, 2007; Walumbwa, Hartnell, & Oke, 2010). To date, with few exceptions (e.g. Sun, Zhang, Qi, & Chen, 2012) research on the relationship between transformational leadership and employee creativity has neglected to examine the role of social mechanisms such as group climate in this relationship.

As 'climate engineers' (Kozlowski & Doherty, 1989), leaders have been suggested as well as empirically shown to influence employee behavior through signaling expected or normative behaviors. Consequently, it is important that research examines the leader's influence in shaping employees' shared perception of their work context and how this shared perception in turn, influences employee creativity. In delineating the social context linking transformational leadership and employee creativity, prior research has focused on group climates that empower and motivate employees (e.g. Sun et al., 2012). Drawing on the social informational process (SIP) perspective (Salancik & Pfeffer, 1978), this paper proposes a different mechanism for explaining the effects of transformational leadership. The SIP perspective suggests that the social cues provided by the significant others (e.g. the supervisor and peers) will influence one's perceptions of the work environment and their consequent behaviors. Accordingly both transformational leadership and psychological safety climate convey important social cues regarding creative engagement indicating to the group members that involvement in creative activities is appropriate and acceptable. Such shared perceptions of work environment will influence employee's engagement in creative processes. Given

leaders' pivotal role in shaping group climate we argue that the impact of transformational leadership on creative process engagement will be indirect via its impact on psychological safety climate. The first objective of this study therefore is to examine the mediating effect of psychological safety climate on the relationship between transformational leadership and creative process engagement.

While creative process engagement has been shown to relate to employee creativity (Zhang & Bartol, 2010), a dearth of research has examined the boundary conditions under which this relationship occurs. Although creative process engagement involves mainly one's cognitive processes such as problem identification, information seeking, idea generation (Zhang & Bartol, 2010), these processes are by no means carried out in a vacuum. Rather employees are much likely to engage in extensive interactions with their work group when they go through various sub-processes of creative processes (Amabile, 2008; Binnewies, Ohly, & Sonnentag, 2007) as to bring out creative outcomes. To fully understand the relationship between creative process engagement and creativity one needs to take into account the social context which may enhance or impede this relationship. Accordingly, the second objective of this study is to examine the cross-level moderating influence of psychological safety climate on the relationship between creative process engagement and employee creativity.

[Insert Figure 1 about here]

By pursuing these objectives, this study contributes to the literature in two important ways. First, this study augments recent efforts to understand a leader's influence on employee outcomes via multi-level lenses (e.g. Chen et al., 2007; Kirkman, Chen, Farh, Chen, & Lowe, 2009; Shin, Kim, Lee, & Bian, 2012; Wang & Howell, 2012). Although theorists have long suggested that the group level factors may influence employee creativity (Drazin, Glynn, &

Kazanjian, 1999; Woodman, Sawyer, & Griffin, 1993), research has yet to examine how transformational leadership at the group level influences the individual-level creative process engagement. By integrating insights from the climate literature (Kozlowski & Doherty, 1989) and the SIP perspective (Salancik & Pfeffer, 1978), we examine psychological safety climate as an underlying cross-level mechanism linking transformational leadership and creative process engagement. By so doing this study shows that transformational leaders can facilitate creative process engagement through fostering a safety climate for interpersonal interactions thereby pointing an indirect route through which transformational leaders can employ to promote creative activities. Second, we extend previous research on creative process engagement by examining the moderating influence of psychological safety climate on the link between creative process engagement and creativity. Although literature has long suggested that social-contextual factors exert much influence on one's creative processes (Amabile, 1983), little research however has been devoted to understand whether a social context such as psychological safety climate may strengthen or weaken the link between creative process engagement and creativity. Therefore, the study contributes to research on the boundary conditions of the creative process engagement-creativity relationship.

**Theoretical Background and Hypothesis Development**

Consistent with Amabile's (1983, 1996) influential work of social psychology of creativity, much research on the relationship between transformational leadership and creativity has emphasized the motivational functions of transformational leadership (Shalley & Gilson, 2004). While the motivational mechanisms undoubtedly are relevant, they however are not useful in explaining the indirect effects of transformational leadership on creativity via influencing the social context. Indeed, new developments in the creativity research have noted the critical role of interpersonal interactions in the creative endeavors (Drazin,

Kazanjian, & Glynn, 2008; Ford, 1996; Perry-Smith, 2006), and the paramount influence of group level factors (Hirst, Van Knippenberg, Chin-Hui, & Sacramento, 2011; Hirst, Van Knippenberg, & Zhou, 2009) on individual creative expression. Given leaders are responsible for the management of the context (the group) as well employees, it is imperative to identify the social mechanisms that transformational leadership can employ to influence employee creativity.

From the SIP perspective, employees' social context (the group) provides important cues as to what kinds of behaviors are appropriate and acceptable in the workplace. As adaptive organisms, individuals adapt their attitudes and behaviors according to their social context (Salancik & Pfeffer, 1978). Whether a group is perceived to be safe for new ideas and/or tolerant to errors is likely to be a potent factor influencing employees' creative process engagement. We propose that employees need to experience a climate of psychological safety within the group so as to engage in creative activities and transformational leadership fosters such a safe climate.

**Transformational leadership and psychological safety climate**

Consistent with prior research (Bradley, Postlethwaite, Klotz, Hamdani, & Brown, 2012; Edmondson, 1999; Hirak, Peng, Carmeli, & Schaubroeck, 2012), psychological safety climate is conceptualized as a group level variable which describes the extent to which group members share a belief that it is safe to engage in risky behaviors such as questioning current practices without retribution or negative consequences. Residing in the same social system (the group) and being influenced by the same structural source, group members develop perceptions of their shared experience leading to a shared belief (Walsh, 1995). This emergence process has been frequently observed at the group level analyses (e.g. Naumann & Bennett, 2002; Tesluk, Vance, & Mathieu, 1999). Prior research has highlighted the

predominant role of group leader in shaping and engineering such a process (e.g. Liao & Chuang, 2007; Walumbwa et al., 2010). Similarly, in search of antecedents of psychological safety, researchers have shown that team leaders' coaching (Edmondson, 2003), behavioral integrity (Leroy et al., 2012), supervisory support (May, Gilson, & Harter, 2004) and being available and accessible to all team members (Hirak et al., 2012) enhance employees' perception of psychological safety. In line with prior research this paper examines whether transformational leadership fosters a psychological safety climate.

Transformational leadership is characterized by four dimensions (Bass, 1985): i*dealized influence* (inspiring followers to identify with them and their mission); *inspirational motivation* (articulating shared goals and a clear, compelling vision that arouses followers and promotes positive expectations); *intellectual stimulation* (challenging followers to question assumptions, take risks, think critically, and identify and solve problems proactively; and *individualized consideration*, (addressing followers' needs and treating them uniquely). This paper argues that by demonstrating the above four dimensions transformational leaders help create a safe interpersonal environment in which employees consider it appropriate to exchange ideas and ask challenging questions. This is in line with the social information processing theory (Salancik & Pfeffer, 1978) which suggests that people draw on social cues in their immediate environment to form perceptions about values, norms and acceptable behaviors. Through idealized influence and inspirational motivation, transformational leaders promote mutual support and trust among employees by emphasizing the collective and shared goals. As members of the same group are exposed to the same influence of transformational leadership, they are likely to form convergent perceptions that cooperative rather than competitive relationships are the norm among group members. Consequently, employees will believe that their colleagues will provide support and help when needed

leading to a high level of psychological safety. Similarly, through intellectual stimulation transformational leaders form behavioral norms that new ideas and new ways of doing things are acceptable and encouraged in the group thereby enhancing psychological safety among group members. Subject to the same source of influence, group members will emulate the individualized consideration demonstrated by transformational leaders and learn to respect individual differences and needs of each other. Consequently, employees will become more tolerant of and open to the differences existing among group members contributing to a work environment characterized by low levels of risk regarding self-expression and taking initiatives. Taken together, transformational leaders shape a work environment in which group members respect and value each other leading to a high level of psychological safety climate.

**H1:** Transformational leadership positively relates to psychological safety.

**Psychological safety climate and creative process engagement**

In line with Zhang and Bartol (2010) creative process engagement is defined as the extent to which employees engage in the problem-identification, information searching and ideas/solution generation activities. Creative process engagement is conceptually related to but distinct from creativity, a construct that focuses on creative outcomes- useful and new ideas that help improve products/service, process, provide new ways of doing things, and solve problems at work (George & Zhou, 2001). Although creative process engagement is an important precursor to creativity (Amabile, 1983), it emphasizes on 'the journey toward possibly producing creative outcomes' (Gilson & Shalley, 2004: 454). The resultant outcome of such a journey may not necessarily be creative (Drazin et al., 1999).

Creativity researchers have noted that the creativity-as-a-process aspect has received little attention in the creativity literature (Shalley et al., 2004; Zhang & Bartol, 2010) and called for more research on creative processes (Lubart, 2001; Shalley et al., 2004; Zhang & Bartol, 2010). According to Amabile's (1983, 1996) componential model, creative process is a cognitive process fuelled by individuals' motivation, domain-related knowledge and divergent thinking skills leading to creative outcomes. Following these cognitive and motivational focus, scholars have found that training focusing on divergent thinking skills positively related to creative process engagement (Basadur, Graen, & Green, 1982; Scott, Leritz, & Mumford, 2004). However, the cognitive aspect of the creative process has been narrowly defined as the cognition of the problem/task itself and excluded the cognition of the social environment. Prior research has suggested creative process engagement involves not only one's cognitive skills related to the task/problem and motivational attributes but also his or her interactions with others (Binnewies et al., 2007; Gilson & Shalley, 2004). This paper therefore argues that employees' cognition about the interpersonal interactional climate such as psychological safety climate in their work environment needs to be taken into account in understanding employee's creative process engagement.

Research has suggested that whether employees engage in their tasks is largely influenced by their experience at work (Hackman & Oldham, 1975; Kahn, 1990). According to Kahn (1990), employee engagement describes a state in which a person directs his or her physical, cognitive, and emotional labor at work. Kahn (1990) further explained that three psychological conditions influence the degree to which people engage in their tasks: experienced meaningfulness (How meaningful is my job?), psychological safety (how safe is it for me to do so?) and availability (how available am I to do so?). This paper argues that of the three psychological conditions, experienced psychological safety is the most relevant to

creative process engagement. A psychologically safe work environment fosters tolerance of different opinions, acceptance of mistakes, and provision of support and help to colleagues (Edmondson, 1999). Creative processes are fraught with risks and obstacles. It is not unusual that new ideas may be perceived as threatening and therefore met with resistance from colleagues (Staw, 1995). It is natural for employees to assess the interpersonal work climate to decide whether it is safe to engage in creative process or not (Drazin et al., 2008; Ford, 1996). In a psychologically safe environment, employees should be able to 'employ one's self without fear of negative consequences to self-image, status or career' (Kahn, 1990 : 708). They are less likely to refrain from self-expressing, taking initiatives, discussing failures or problems (Hirak et al., 2012) and presenting new ideas (West, 1990). Furthermore, they are more likely to be charged with positive energy and vitality (a state that individuals experience positive energy and aliveness)(Kark & Carmeli, 2009) and become physically, cognitively and emotionally involved. This will, in turn, lead to creative process engagement. Therefore,

**H2:** Psychological safety climate is positively related to creative process engagement.

We have argued that as 'climate engineers', transformational leaders promote psychological safety climate through shaping shared goals and behavioural norms among group members. In turn, psychological safety climate allows employees to self-express and get deeply involved at work (Kahn, 1990). Consequently employees are more likely to take initiatives and engage in problem-identification, informational seeking and idea generation, activities related to creativity. Thus, psychological safety may act as an underlying mechanism through which transformational leadership relates to creative process engagement.

**H3:** Psychological safety mediates the relationship between transformational leadership and creative process engagement

**The moderating influence of psychological safety climate**

Although theorists have suggested that contextual factors interact with individual factors to influence employee creative outcomes and the process leading to those outcomes (Amabile, 1983, 1996; Woodman et al., 1993), research has yet to examine the extent to which the social context interact with creative process engagement to influence creative outcomes. Drawing on the interactionist perspective of creative performance, we propose that psychological safety climate constitutes a boundary condition that attenuates the impact of creative process engagement on creativity. The link between creative process engagement and creativity can be seen as a process through which individuals discuss, communicate and verify their ideas with the social environment in which they reside (Amabile, 1996; Stein, 1974). A high psychological safety climate fosters a context in which employees share ideas and information and offer support to colleagues (Edmondson, 1999). For employees who engage in creative processes, such a context offers a broader knowledge base (Perry-Smith, 2006) and quality information which help refine and improve their ideas leading to high levels of creativity (Lubart, 2001). In contrast, in a low psychological safety work environment, employees are less likely to tap on the information and knowledge resources held by other team members. Although employees may engage in creative processes, the narrow scope of their understanding of problems will limit their chances of improving the quality of their ideas resulting in less creative solutions. Furthermore, it is not unusual that creative process engagement may produce alternatives, ranging from creative to non-creative options (Ford, 1996; Lubart, 2001). Employees are more likely to opt for creative rather than habitual or non-creative options when they perceive a high, as opposed to low, psychological safety climate as creative options will not be punished or rejected by colleagues in such a work environment (Ford, 1996). We therefore propose that:

**H4:** Psychological safety climate moderates the relationship between creative process engagement and creativity such that the relationship between creative process engagement and creativity will be stronger in groups with high rather than low psychological safety climate.

## METHOD

### Sample and procedure

Data for this study were obtained from two IT firms in a coastal city of a southern province in the People's Republic of China. Participants were IT engineers who worked in teams and were expected to demonstrate creativity in their job. Questionnaires were distributed to respondents by research team coordinators. Informed of the data collection procedures, these coordinators approached human resource departments and obtained a list of subordinates and their supervisors from them. With the assistance of one of the authors, the coordinators randomly selected 2-4 subordinates of each supervisor to participate in the study. A survey package was sent to each of the subordinates through their mailbox whereas survey packages for the supervisors were distributed during a meeting to explain the objectives of the survey. Codes and names of 2-4 direct subordinates under his or her supervision were written on the questionnaire. A cover letter attached to each of the questionnaires informed participants of the confidentiality of their responses and the voluntary nature of participation in the survey. They were also assured that their personal ID code (provided at the top right hand corner of the questionnaire) would only be used to match their responses to the ratings provided by their supervisors.

The coordinators sent out two sets of questionnaire: one for employees (400) and the other for supervisors (150). Employees completed a questionnaire that included measures of transformational leadership, psychological safety, creative process engagement and

demographics variables. Separately, supervisors were asked to rate subordinates' creativity. Complete and usable questionnaires were received from 342 employees (73% response rate) and 126 supervisors (69% response rate). On average each supervisor rated 2.71 employees (with a range of 2-4 employees per supervisor). Of the 342 respondents, 196(53.6%) were male. Respondents reported an average age of 28.16 years (SD = 6.21), an average organizational tenure of 4.78 years (SD = 5.51), an average education of 15.14 years (SD = 1.86) and an average time with supervisor of 5.57 years (SD = 5.51).

Measures

The questionnaire was originally developed in English but translated into Chinese. Following the procedures recommended by Brislin (1980), the Chinese version of the questionnaire was back-translated into English to ensure equivalence of meaning. With the exception of creativity that was based on supervisor ratings, all other measures were based on self-reports. Unless otherwise indicated, response options ranged from (1) ´strongly disagree´ to (5) ´strongly agree´.

*Creativity*. A 3-item scale developed by Oldham and Cummings (1996) was used to measure creativity. A sample item is 'How creative is this person's work: Creativity refers to the extent to which the employee develops ideas, methods, or products that are both original and useful to the organization.' Supervisors rated creativity of each of their subordinates who participated in the survey. The scale's alpha reliability in this study is .75.

*Transformational leadership*. A 20-item scale (Multifactor leadership Questionnaire, MLQ) was used to measure transformational leadership (Rater Form 5X; Bass & Avolio, 2004). The MLQ has four dimensions: idealized influence (e.g., "Talks about his or her most important values"), individualized consideration (e.g. Treats me as an individual rather than just as a member of a group"), intellectual stimulation (e.g. "Suggests new ways of looking at

how to complete an assignment"), and inspirational motivation (e.g. "Talks enthusiastically about what needs to be accomplished). Following previous research (Bono & Judge, 2003; Piccolo & Colquitt, 2006), these four dimensions were averaged to form a global measure of transformational leadership. The scale's alpha reliability is .94.

Psychological safety. A 7-item scale developed by Edmondson (1999) was used to measure psychological safety. A sample item is 'Members of my group are able to bring up problems and tough issues.' The scale's alpha reliability is .79.

Creative process engagement. An 11-item scale developed by Zhang and Bartol (2010) was used to measure creative process engagement. Sample items are, 'I spend considerable time trying to understand the nature of the problem' (problem identification); 'I consult a wide variety of information' (information searching and encoding); and 'I consider diverse sources of information in generating new ideas'(idea generation). Following Zhang and Bartol (2010), these three dimensions were averaged to form a global measure of creative process engagement. The scale's alpha reliability is .89.

Controls. An important individual attribute, creative self-efficacy, was controlled for in this study. Creative self-efficacy refers to the belief in one's ability to produce creative outcomes (Tierney & Farmer, 2002) and has been shown to relate to employee creativity (Gong et al., 2009; Tierney & Farmer, 2002, 2004). A 3-item scale developed by Tierney and Farmer (2002) was used to measure creative self-efficacy. A sample item is "I have confidence in my ability to solve problems creatively.' The scale's alpha reliability is .76. Additionally, educational level and organizational tenure were controlled for because they constitute proxies for knowledge and experience, which are important for individual creativity (Amabile, 1983). Time with supervisor was controlled for as research has suggested that time with supervisor may influence the impact of transformational leadership on employee outcomes

(Hoffman, Bynum, Piccolo, & Sutton, 2011; Shin & Zhou, 2007). At the unit level, we controlled for organization membership as organizational factors may compound the influence of leaders. We created one dummy variable, Org to represent the two organizations. Finally, we controlled the gender of the supervisor as the leadership literature has suggested that leader's gender may influence leadership styles and the effectiveness of leadership (Eagly & Carli, 2003; Eagly, Johannesen-Schmidt, & van Engen, 2003). Similarly, a dummy variable was created for supervisor gender.

Data Analysis

As data on the independent variables were collected from employees, common method variance could potentially influence the relationships examined (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Consequently, using AMOS 20 we conducted a confirmatory factor analysis (CFA) to compare the hypothesized 4-factor model (transformational leadership, psychological safety, creative self-efficacy and creative process engagement) to a series of intuitively plausible alternative nested models: (1) a 3-factor model A (combining creative self-efficacy and creative process engagement); (2) a 3-factor model B (combining transformational leadership and psychological safety); and (3) a 1-factor model (combining all variables). In the measurement model the dimensions of multi-dimensional constructs (transformational leadership and creative process engagement) were used as manifest indicators of a latent construct. We used the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) to assess model fit. A value of .90 or more is seen as a reasonable minimum for model acceptance for CFI and TLI (Bentler, 1990; Bentler & Bonett, 1980); A value of .08 or less is indicative of a reasonable model fit for RMSEA and SRMR

(Hu & Bentler, 1999). In addition, we used chi-square difference test to determine the best fitting model.

Results of the CFA suggest that the hypothesized 4-factor model had a reasonable fit with the data ($\chi^2$ = 322.03, *df* = 112, $\chi^2/df$ = 2.88, CFI = .92, TLI = .90, RMSEA = .074 (CI = .065-.084), SRMR = .057). Furthermore, nested model comparisons showed that the hypothesized 4-factor model had a significantly better fit than the 3-factor model A, ($\Delta \chi^2$ = 93.52 $\Delta$df =3), the 3-factor model B, ($\Delta \chi^2$ = 224.70, $\Delta$df =3), and the 1-factor model, ($\Delta \chi^2$ = 451.75, $\Delta$df =6), indicating the distinctiveness of the study variables. We also examined the effects of adding a latent common method factor to the hypothesized 4-factor measurement model. Although the model fit the data better than the hypothesized model ($\chi^2$ = 199.91, *df* = 95, $\chi^2/df$ = 2.10, CFI = .96, TLI = .94, RMSEA = .057 (CI = .046-.068), SRMR =.040), the variance extracted by the common method factor was only .22, lower than the .50 cutoff that has been suggested as indicating the presence of common method bias (Dulac, Coyle-Shapiro, Henderson, & Wayne, 2008; Hair, Anderson, Tatham, & Black, 1998). Therefore, although it is possible that common method variance may be present in the data, it did not appear to have been a serious problem.

To support the aggregation of transformational leadership and psychological safety climate, we tested the statistics for $r_{wg}$ (James, Demaree, & Wolf, 1984) and interclass correlations (ICC(1) and ICC (2). Median $r_{wg}$ values for transformational leadership and psychological safety were .98 and .95, respectively. Furthermore, the values of ICC(1) and ICC(2) for transformational leadership were .53 and .75, respectively for transformational leadership (df =125, 216, F = 2.915, p <.001) and those for psychological safety climate were .41 and .66, respectively (df =125, 216, F = 4.042, p <.001). Both transformational leadership and psychological safety showed strong agreement among group members and significant mean

differences among units (Bliese, 2000). Thus, it is justifiable to aggregate the transformational leadership and psychological safety scores to the group level.

To test the hypothesized positive relationship between transformational leadership and psychological safety (H1), we used hierarchical multiple regression as both variables were at the unit level. However, given the multilevel nature of the data, we used HLM 7 to test the rest of our hypotheses (H2-H4). Furthermore, results of null models confirmed that 38% of the variance in creativity and 41% of the variance in creative process engagement resided between groups warranting the use of HLM in our analyses. Following Enders and Tofighi (2007) and Aguinis, Gottfredson and Culpepper (2013), we grand-mean centered the predictors at the individual level but controlled for the across-group variance by including the group mean of creative process engagement and its interaction term with psychological safety climate to partial out the potential L2 interaction.

## RESULTS

Table 1 shows the descriptive statistics, internal consistency reliabilities, and intercorrelations of all study variables.

[Insert Table 1 about Here]

Hypothesis 1 suggested that transformational leadership would be positively related to psychological safety climate at the group level. The results of hierarchical regression analysis showed that transformational leadership significantly positively related to psychological safety climate ($\beta = .60$, $p < .001$) after we controlled for organization ($\beta = -.16$, $p < .05$), and supervisor gender ($\beta = .21$, $p < .05$) (Model 1) thereby providing support for Hypothesis 1. In total, transformational leadership and the controls explained 36% of the variance in psychological safety climate.

[Insert Table 2 Here]

Hypothesis 2 suggested that psychological safety climate would be positively related to creative process engagement. Table 2 shows that psychological safety climate was positively related to creative process engagement after we controlled for organization and supervisor gender at the unit level and employee tenure, education, time with supervisor and creative self-efficacy at the individual level ($\gamma$ = .44, s.e. = .08, $p < .001$; Model 1). Thus, Hypothesis 2 was supported. Hypothesis 3 suggested that psychological safety climate would mediate the influence of transformational leadership on creative process engagement. Following the procedures suggested by Mathieu and Taylor (2007), we tested the hypothesized cross-level mediating influence of psychological safety climate. Table 2 shows that transformational leadership was positively related to creative process engagement ($\gamma$ = .36, s.e. = .07, $p < .001$; Model 2) after we controlled for organization and supervisor gender at the unit level and employee tenure, education, time with supervisor and creative self-efficacy at the individual level. However, this relationship became weaker ($\gamma$ = .24, s.e. = .06, $p < .01$) when psychological safety climate was entered into the equation while psychological safety was positively related to creative process engagement ($\gamma$ = .29, s.e. = .08, $p < .01$; Model 3), indicating a partial mediating effect. To further test whether the indirect effect of transformational leadership on creative process engagement via psychological safety climate was significant from zero and in line with MacKinnon, Lockwood, Hoffman, West, & Sheets (2002) and Sobel (1982), we calculated the 95% confidence intervals (CIs) of the observed indirect effect. If the 95% confidence interval for a regression coefficient excludes zero, the coefficient is statistically significant at the .05 level. Using the web application provide by Tofighi and MacKinnon (2011), we entered the regression coefficient and standard error for the path between transformational leadership and psychological safety climate and that between psychological safety climate and creative process engagement. Results showed that

the indirect effect of transformational leadership on creative process engagement via the mechanism of psychological safety climate was significantly different from zero (95% CI = .058 to .219). Thus Hypothesis 3 was supported.

Hypothesis 4 suggested that psychological safety climate would moderate the relationship between creative process engagement and creativity. Following Bryk and Raudenbush (1992), we estimated a slopes-as-outcomes model to test whether the strength of the relationship between creative process engagement and creativity will change as a function of psychological safety climate at the group level. In model 4, we regressed creativity simultaneously on psychological safety climate, creative process engagement and the interaction of psychological safety climate and creative process engagement. Consistent with the above analyses, we controlled for education, tenure and creative self-efficacy at the individual level and organization and leader's gender at the group level. In addition, we also included in the model transformational leadership, the interaction term of psychological safety and creative self-efficacy, the group mean of creative process engagement and its interaction term with psychological safety. The results revealed that the interaction between psychological safety climate and creative process engagement was significant ($\gamma$ = .20, s.e. = .10, $p<.05$). To estimate the effect size, we calculated the pseudo $R^2$ for Model 4 without the interaction term of psychological safety climate and creative process engagement in the model. The results showed the pseudo $R^2$ for this variant Model 4 was .23, .02 lower than the pseudo $R^2$ of the complete Model 4. Thus, the cross-level interaction term accounted for an additional 2% of variance in creativity. Following Aiken and West (1991), we plotted the interaction effect using values of one standard deviation below the mean and one standard deviation above the mean on psychological safety climate to interpret the nature of the significant two-way interaction. As shown in Figure 2, the relationship between creative

process engagement and creativity is stronger when psychological safety climate is high than when it is low. In addition, results of simple slope tests showed that the simple slope under conditions of high psychological safety climate was significantly different from zero ($b = .60$, $z = 3.723$, $p < .001$) while the simple slope under conditions of low psychological safety climate was nonsignificant ($b = .20$, $z = 1.570$, $p > .05$). Taken together, the preceding pattern of results suggests support for Hypothesis 4.

[Insert Figure 2 Here]

## DISCUSSION

Applying the social informational processing perspective this study sought to investigate the social mechanism linking transformational leadership and employee creativity. We found that transformational leadership influences employee creative process engagement through the mechanism of psychological safety climate. Furthermore, psychological safety climate moderated the relationship between creative process engagement and creativity such that the relationship was stronger when psychological safety climate was high rather than low.

### Theoretical Implications

Unlike prior research which has by and large examined the influence of transformational leadership on employee creativity via individual motivational variables (e.g. intrinsic motivation, creative self-efficacy), we studied how transformational leadership influences employee creativity by shaping a social context that is conducive to creativity. The finding that transformational leadership had an indirect effect on creative process engagement via psychological safety climate lends empirical support to the theoretical notions that leadership is a multilevel process (Kozlowski & Bell, 2003) and employee behaviors are subject to the influence of ambient or environmental stimuli (Hackman, 1992; Kirkman et al., 2009; Wang & Howell, 2012). By emphasizing the interpersonal interaction context, this finding adds a

unique angle in the understanding of the process through which transformational leadership influences creativity and highlights the importance of examining the role of contextual variables in the transformational leadership-creativity relationship.

We found that the relationship between creative process engagement and creativity is stronger when psychological safety climate is high but nonsignficant when psychological safety climate is low. By going beyond the examination of the main effects of creative process engagement on creative outcomes (Zhang & Bartol, 2010), we answered the call for more research on creative process (Shalley et al., 2004) and investigated what makes creative process creative (Lubart, 2001). Our finding is consistent with Baer and Frese (2003) albeit at a different level. Using a sample of 47 mid-sized German companies, Baer and Frese (2003) found that psychological safety climate strengthened the relationship between a firm's innovative process and performance. By replicating the moderating influence of psychological safety climate on the individual level process (i.e. the link between creative process engagement and creativity), our study provides evidence for the generalizability of the moderating influence of psychological safety. Furthermore, the moderating influence of psychological safety climate may help explain the interesting finding reported in Frese, Teng and Wijnen (1999) that employees having ideas (as a result of creative process engagement) did not subsequently submit their ideas and have their ideas recognized by the organization. It is possible that some aspects of the social context such as low psychological safety climate may have prevented employees from bringing forth their ideas.

Practical Implications

The findings of this study provide actionable knowledge that organizations can use to foster creativity. Specifically, our finding suggests that transformational leaders can indirectly influence individual creative engagement via fostering positive interpersonal climate within

the work group. Team leader should be encouraged to take up the role of 'climate engineer' and learn how to create psychological safety climate within their group. Therefore, leadership development programs should include elements that focus on leadership skills and behaviors that facilitate a safe environment for employees to discuss tough issues, share information and exchange new ideas. Such a safe environment will eventually help employees transfer their creative endeavors into creative outcomes.

Limitations and Directions for Future Research

As with any research, this study has some limitations which must be highlighted. First, given the cross-sectional research design, the direction of causality cannot be clearly determined. It is possible that employees who perceive a high level of psychological safety climate may rate their supervisor more favorably. Future research that uses a longitudinal research will be better suited to ascertain the causal status of the relationships reported in this study. Second, apart from creativity being rated by supervisors, data on the rest of the study variables were based on self-reports giving rise to concerns about the potential influence of CMV on the findings reported in our paper. However, CFA results and the single latent common method factor tests revealed that these findings are not entirely attributable to CMV. This is particularly so as CMV cannot account for the significant cross-level interaction effects reported in this study. The finding that the cross-level main effects all exceeded the .01 significance level indicates that the significant cross-level main effects were unlikely subject to CMV bias (Lai, Li, & Leung, 2013). Nevertheless and to mitigate the potential influence of CMV, we suggest that future research should obtain data on some of the individual-level variables from peers. Third, although our sample size at the individual and group levels was above the average reported in Dalton et al (Dalton, Aguinis, Dalton, Bosco, & Pierce, 2012), each supervisor in our sample only rated about three employees. This raises a concern about

whether there was enough statistical power to detect cross-level effects (Mathieu, Aguinis, Culpepper, & Chen, 2012). However, the literature has yet to provide a definite formula on how large the sample size at level one (i.e. individual level) versus level two (i.e. work group level) should be in order to provide sufficient power in estimating the cross-level effects (Scherbaum & Ferreter, 2009; Snijders, 2005). Furthermore, given the fact that all our hypotheses were about either Level 2 direct effects (H1) or cross-level effects (H2-H4), our sample size at the group level rather than that at the individual level may be more relevant with regard to statistical power (Raudenbush & Liu, 2000). Nevertheless future research should further explore the extent to which the sample size of each level might affect the effect size of the relationships examined in the cross-level models.

Another limitation of this study is that the reliability of a number of scales (i.e. creativity (.76), self-efficacy (.75) and psychological safety (.78) was slightly lower than the suggested cut-off value of .80 (Lance, Butts, & Michels, 2006). It is important to note that low reliability has been suggested to attenuate the relationship between variable and reduce analysis power (McClelland & Judd, 1993). Thus, our results may underestimate the true strength of relationships reported in this study.

The prevalence of collectivism (Hofstede, 1980; Markus & Kitayama, 1991) and the emphasis on 'Guanxi'(Hui & Graen, 1997) in Chinese society means that employees are more sensitive to the quality of interpersonal relationship they experience at work. It is possible that the observed effects may have been relatively salient in such a cultural context. Future research may explore whether cultural values may have influenced the relationships examined in this study by using samples from multiple countries.

## Conclusion

In view of the criticality of employee creativity to organizational effectiveness and the important role of transformational leadership in engendering such behavior, more research is needed to unpack the complex process through which transformational leadership influences employee creativity. Future research should extend the findings of this study by including a multilevel set of mediators and moderators in order to more completely understand how transformational leadership promotes employee creativity across the individual and group levels.

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Table 1: Means, Standard Deviations, and Intercorrelations among all study variables

| | | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Level 1 variables (N = 342)** | | | | | | | | | | | |
| 1 | Org. | -- | -- | -- | | | | | | | | |
| 2 | Education | 15.14 | 1.86 | -.26** | | | | | | | | |
| 3 | Tenure | 4.78 | 5.51 | .25** | -.14* | | | | | | | |
| 4 | Time with supervisor | 5.57 | 5.51 | -.23** | .02 | .49** | | | | | | |
| 5 | Creative self-efficacy | 3.50 | .69 | .06 | .25** | .03 | -.02 | **.75** | | | | |
| 6 | Transformational leadership | 3.43 | .67 | .33** | .04 | .01 | -.17** | .48** | **.94** | | | |
| 7 | Psychological safety | 3.48 | .57 | .06 | .16** | -.01 | .01 | .59** | .55** | **.78** | | |
| 8 | Creative process engagement | 3.59 | .58 | .11* | .14* | -.04 | -.03 | .55** | .53** | .59** | **.89** | |
| 9 | Creativity | 2.95 | .79 | -.04 | .15** | -.06 | -.14** | .28** | .13* | .25** | .28** | **.76** |
| | **Level 2 variables (N = 126)** | | | | | | | | | | | |
| 1 | Org | -- | -- | | | | | | | | | |
| 2. | Supervisor gender[a] | -- | -- | .07 | | | | | | | | |
| 3. | Transformational leadership | 3.47 | .43 | .37** | .04 | | | | | | | |
| 4. | Psychological safety | 3.35 | .56 | .08 | .22* | .55** | | | | | | |

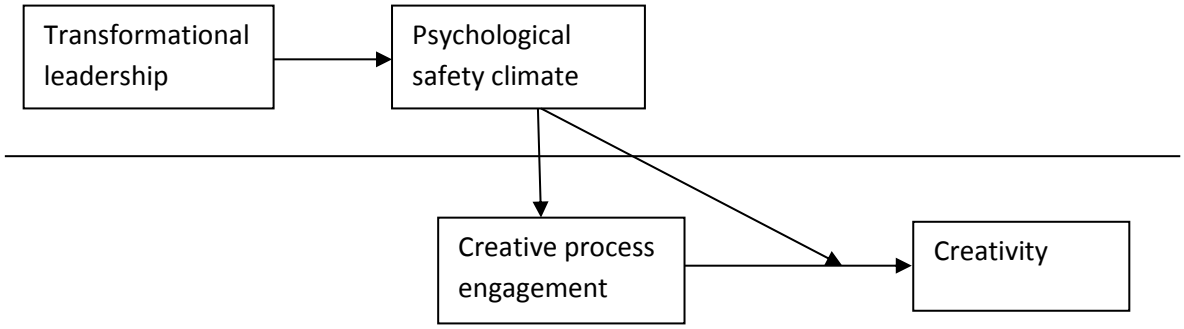
Note: *p < .05, ** p< .01. [a] 0 = male, 1 = female.

Table 2: Hierarchical Linear Modeling Results

| | Null 1 | Model 1 | Model 2 | Model3 | Null 2 | Model4 |
|---|---|---|---|---|---|---|
| | CPE | CPE | CPE | CPE | Creativity | Creativity |
| ***Level 1*** | | | | | | |
| Intercept | 3.57***(.04) | 3.09***(.26) | 3.04 ***(.23) | 3.10*** (.23) | 2.96*** (.05) | 3.05*** (.09) |
| Education | -- | .03 (.02) | .03 (.02) | .03 (.02) | -- | -.05 (.03) |
| Tenure | -- | .00 (.01) | -.01 (.01) | -.01 (.01) | -- | .00 (.01) |
| Time with supervisor | -- | .01 (.01) | .01 (.01) | .01 (.01) | -- | .02 (.02) |
| Creative self-efficacy (EFF) | -- | .30*** (.05) | .31*** (.05) | .28*** (.05) | -- | .11 (.06) |
| Creative process engagement (CPE) | -- | -- | -- | -- | -- | .40*** (.10) |
| ***Level 2*** | | | | | | |
| Org[a] | | .14* (.06) | .02 (.06) | .05 (.06) | -- | -.15 (.12) |
| Supervisor gender[b] | -- | -.10 (.06) | -.02 (.06) | -.08 (.05) | -- | -.15 (.10) |
| Transformational leadership | -- | -- | .36*** (.07) | .24*** (.06) | -- | .03 (.07) |
| Psychological safety | -- | .44*** (.08) | -- | .29*** (.08) | -- | .09 (.07) |
| Group CPE | -- | -- | -- | -- | -- | -.16* (.08) |
| Psychological safety x Group CPE | -- | -- | -- | -- | -- | .03 (.06) |
| ***Cross-level interaction*** | | | | | | |
| Psychological safety x EFF | -- | -- | -- | -- | -- | -.13* (.06) |
| Psychological safety x CPE | -- | -- | -- | -- | -- | .20* (.10) |
| ***Variance components*** | | | | | | |
| Within-team variance ($\sigma^2$) | .196 | .151 | .146 | .151 | .381 | .294 |
| Between-team variance ($\tau_{00}$) | .130 | .048 | .049 | .04 | .228 | .164 |
| ***ICC*** | .41 | | | | .38 | |
| ***-2 log likelihood (FIML)*** | 542.23 | 451.42 | 450.66 | 441.51 | 761.21 | 747.12 |
| ***Number of estimated parameters*** | 2 | 4 | 4 | 4 | 2 | 11 |
| ***Pseudo $R^2$*** | 0 | .39 | .40 | .42 | 0 | .25 |

Note: *p < .05, *** p < .001. [a] dummy variable; [b]0 = male, 1 = female; FIML = full information maximum likelihood estimation; ICC = intra-class correlation coefficient; EFF = Creative self-efficacy; CPE = creative process engagement; Values in parentheses are standard errors.

Figure 1: The Hypothesized Model



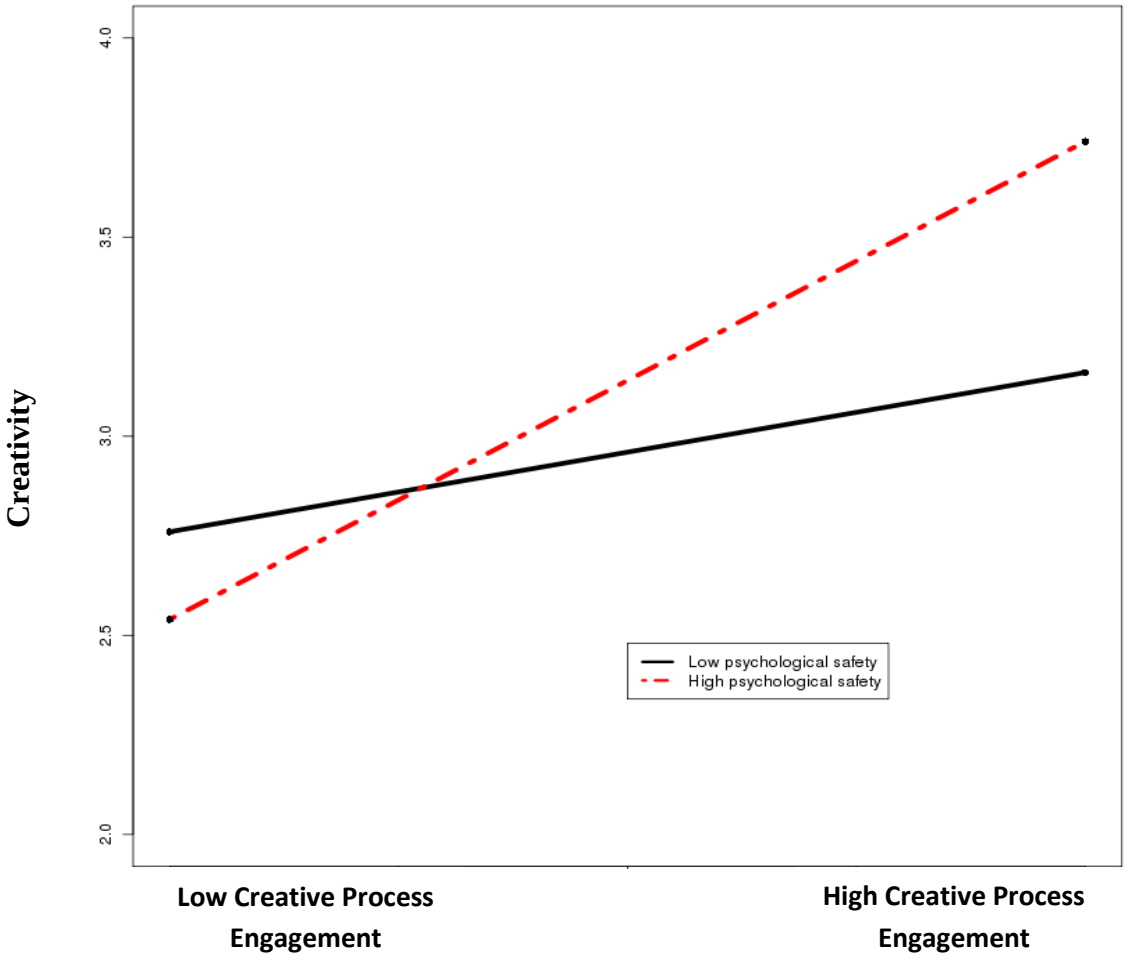



Figure 2: The Moderating Influence of psychological Safety Climate on the Relationship between Creative Process Engagement and Creativity